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EDITORIAL.

Improvement of Derris Stock.

Research work conducted at the Department of Agriculture on derris has been mainly directed to a study of the varieties or strains, the toxic content of each, variations in toxicity under different conditions—such as age of plant and environment—with the ultimate object of encouraging the cultivation of varieties of high toxicity and of eliminating as far as possible, the variability in quality of commercial consignments of roots.

Articles describing the conduct and progress of these experiments have been published from time to time in this Journal and in the series of special bulletins published by the Department, and have commanded considerable attention in Malaya and elsewhere, to such an extent that certain numbers of these publications are now out of print.

The wide interest evinced in this subject is disproportionate to the present importance of the crop, for the total annual exports of the dried root from Malaya and the Netherlands Indies—the two principal countries of export—do not greatly exceed 1000 tons.

It would appear, therefore, that the interest emanates from planters who look to this crop as a possible source of revenue, and from manufacturers, who see in derris a useful and safe source of insecticide.

The duty of the Department of Agriculture is to guide planters as to the varieties to grow and to assist the trade by ensuring a high-grade product. Considerable progress has been made towards the attainment of these objects, and while at the present time finality has not been reached, the knowledge gained by the Department and made available to planters is sufficiently certain that definite recommendations can be made as to the comparative values of varieties.

An article in the present number on selection experiments with *Derris malaccensis* produces evidence of the behaviour of this variety when grown under different conditions, and shews the variation in toxicity that may be expected between one plant and another.

The authors of the article in this issue point to two conclusions which are of such importance that they are worthy of repetition in this place. Evidence is adduced to prove that while there is considerable variation between one plant and

another, toxicity is not materially affected by environment nor by the weight of crop. The practical bearing of these conclusions is that good quality plants of satisfactory toxicity wherever planted in Malaya should give crops of a predictable toxicity irrespective of whether the particular yield of crop per acre is satisfactory or otherwise. This being so, the more general adoption of proven good stock will go far towards the attainment of the main object of this investigation, namely, to eliminate variability in quality of root offered to the market.

The production of a high quality product will not, however, settle all the difficulties which the planter may encounter. With the greatly increased acreage planted during the past year or so, the market—as yet a small one—may become overstocked, with a consequent lowering of the price level. In some degree this indeed appears to be evident at the present time, for prices have declined considerably during the past few months.

With increased stocks on the market, the buyer will become more discriminating, under which conditions high quality root alone may be sufficient to satisfy the market requirements. We cannot too strongly urge prospective planters to investigate carefully the requirements of the market before embarking on production, in order that ultimately they may be in a position to offer a high quality product which will prove attractive to buyers.

A further point in connexion with marketing is that of preparation of the product for the market. There has, in the past, been a prejudice against the marketing of derris in a powdered form, it being held that there is loss of toxicity on storing such material. As has been pointed out in a previous paper on this subject, investigations have shewn that there are no grounds for this assertion. We believe, in fact, that a great deal of the root produced in the Netherlands Indies is offered for sale in a powdered form, and it may well be that the adoption of this system in Malaya will prove attractive to the trade.

Introduction of Cacao.

The day has not yet arrived when we are in a position to recommend cacao planting in Malaya either on a plantation scale or as a small-holders' crop. The account of investigations at Serdang, together with notes on the cultivation of the tree and preparation of the beans for the market, which forms the subject of an article in this number, is, however, of great interest and introduces the possibility that this crop may at a future date be considered as an addition to Malayan agriculture. Before this decision is made, however, extended trials will be necessary, for too great a reliance should not be placed on the initial success of trees grown under conditions which possibly are difficult of duplication in other parts of the country.

As the authors point out, isolated trees are met with throughout the country; we remember some years ago seeing a number in the Pekan District of Pahang, and we received an enquiry from a Malay of that District regarding the harvesting and treatment of the beans. The Department has more recently initiated an

experiment on the Kuala Lumpur—Bentong road to test the possibilities of cultivating the crop under jungle shade. An investigation of the soil and other conditions under which isolated trees are growing in different parts of the country and the results of present plantings of the Department of Agriculture may reveal additional data as to the range of soils suitable and the conditions under which the crop may succeed. Even should this enquiry fail to point to definite conclusions, it may at least indicate the lines upon which future experiments should be laid down.

In this place we would reiterate our statement that the investigation described in this number should not be used as a basis for the immediate adoption of cacao planting as a commercial product in Malaya.

Original Articles.

FURTHER SELECTION EXPERIMENTS WITH *DERRIS MALACCENSIS*

BY

C. D. V. GEORGI,
Senior Chemist,

AND

GUNN LAY TEIK,
Assistant Analyst.

Introductory.

Attention was drawn in a previous paper ⁽¹⁾ to the necessity for a close study of the two species of derris at present cultivated in Malaya, with the object of developing strains of plants with roots of high toxic content, thereby eliminating to a large extent the variability in quality of commercial consignments of root.

An account was given in the paper referred to above of some experiments carried out with *D. elliptica*. In the present paper the results of a parallel investigation with *D. malaccensis* will be described.

The varieties included at present in this species comprise the following:—

- (a) *D. malaccensis* var. *sarawakensis*
- (b) *D. malaccensis* (Tuba merah)
- (c) *D. malaccensis* (Kinta type).

The first-named variety is sometimes referred to as *D. malaccensis*, Sarawak erect, on account of its erect habit of growth. The botanical nomenclature has, however, been adopted to conform with that used when describing the original selection experiments carried out with this species ⁽²⁾.

An account of the experimental work performed with each variety will now be given.

Outline of Experimental Work.

- (a) *Derris malaccensis* var. *sarawakensis*.

During 1932 a small supply of planting material of the above variety was obtained from an estate in Johore. The cuttings were established in the Experimental Plantation, Kuala Lumpur. When the plants were 25 months old, sixteen plants were lifted at random, the "fine" or marketable roots bulked and analysed. The results of analysis, calculated on a moisture-free basis, were as follows:—

	ozs.
Average weight of air-dry marketable root per plant ...	3.0
	per cent.
Rotenone ...	3.70
Ether extract ...	29.70
Proportion of rotenone to ether extract ...	12.5

The plants were allowed to remain for a further seven months when a similar procedure was adopted, six plants being lifted. The following results were obtained on analysis.

	ozs.
Average weight of air-dry marketable root per plant ...	4.2
	per cent.
Rotenone ...	3.20
Ether extract ...	26.20
Proportion of rotenone to ether extract ...	12.2

Although the results for the sample drawn when the plants were 32 months old were not so favourable as those when 25 months, it was considered that the remaining plants had considerable possibilities as a source of high-grade material. Previous results showed that with an average of 26 per cent. of ether extract there should be a proportion of plants with roots with an ether extract of about 30 per cent.

Cuttings were therefore taken and established both at Kuala Lumpur and at the Central Experiment Station, Serdang.

The soil in Kuala Lumpur is of the Hill Quartzite type and may be described as a sandy clay loam. The cuttings at Serdang were planted in the General Nursery, the plot chosen being one on which tobacco had been grown and which had been heavily manured during the cultivation of that crop. The soil was, therefore, in good heart when the cuttings were planted.

The plants were spaced approximately 3 feet apart in the rows with a similar distance between the rows.

When the plants were between 23 and 24 months old they were lifted. There were 94 plants at Kuala Lumpur and 81 at Serdang.

In harvesting, the whole of the root system of each plant was lifted. The stems of each plant were removed and reserved for the purpose of striking cuttings.

The roots were washed free from adhering soil and dried, and the "fine" or marketable roots separated and weighed. The moisture content of these roots was approximately 8 per cent.

Analysis was restricted to a determination of ether extract in view of the fact that the rotenone content of root of this variety of derris is too low to allow of its being sold on this basis. Subsequently, estimation of rotenone was carried out on six samples selected at random to obtain a further indication of the extent of the variation in the proportion of rotenone to ether extract for this variety.

The methods used were those described in a previous number of this Journal ⁽³⁾.

The weights of marketable roots for individual plants showed considerable variation. Thus in the case of the plants at Kuala Lumpur the weights varied from 12.20 to 1.20 ozs. with an average of 4.20 ozs.; at Serdang from 22.70 to 2.50 ozs. with an average of 8.15 ozs. In the latter case the higher yields can be accounted for by the better soil. Table I, in which the figures are divided into groups of 1 oz. of marketable roots, affords an indication of the frequency of variation.

Table I.

Derris malaccensis var. *sarawakensis*

Weights of Marketable Root from Individual Plants
at Kuala Lumpur and Serdang arranged in
Groups of 1 ounce.

Marketable Root (air-dry basis)	No. of Samples	
	Kuala Lumpur	Serdang
ounces		
23 - 22	—	2
22 - 21	—	—
21 - 20	—	—
20 - 19	—	—
19 - 18	—	1
18 - 17	—	1
17 - 16	—	—
16 - 15	—	—
15 - 14	—	2
14 - 13	—	2
13 - 12	1	2
12 - 11	1	4
11 - 10	—	4
10 - 9	1	8
9 - 8	2	12
8 - 7	5	6
7 - 6	5	6
6 - 5	10	12
5 - 4	18	7
4 - 3	21	10
3 - 2	15	2
2 - 1	15	—
Total	94	81

The figures for ether extract, calculated on a moisture-free basis, show a remarkably close similarity at the two places. Thus for the plants at Kuala Lumpur the figures vary from 29.39 to 20.10 per cent. with an average of 24.77 per cent.; those at Serdang from 28.13 to 19.65 per cent. with an average of 24.20 per cent.

Table II in which the figures are divided into groups of 1 per cent. affords a better indication of the frequency of variation.

The results of the rotenone determinations, which are summarized in Table III, indicate a much wider range of variation than has been found previously with roots of this variety. The figures for the proportion of rotenone to ether extract tend, therefore, also to vary widely. They range from 16.8 to 10.5 per cent. with an average of 14.2 per cent.

Table II.

Derris malaccensis var. *sarawakensis*

**Ether Extract of Marketable Roots from Individual Plants
at Kuala Lumpur and Serdang arranged in Groups
of 1 per cent.**

Ether Extract (moisture-free basis)	No. of Samples		
	Kuala Lumpur	Serdang	Total
per cent.			
30 - 29	2	—	2
29 - 28	4	1	5
28 - 27	12	1	13
27 - 26	10	12	22
26 - 25	15	10	25
25 - 24	14	21	35
24 - 23	17	19	36
23 - 22	13	10	23
22 - 21	3	5	8
21 - 20	4	1	5
20 - 19	—	1	1
Total	94	81	175

Table III.

Derris malaccensis var. *sarawakensis*

**Relationship between Rotenone Content and Ether Extract
of Marketable Roots from Individual Plants at
Kuala Lumpur and Serdang.**

Serial No. of Plant	Rotenone (moisture-free basis)	Ether Extract (moisture-free basis)	Proportion of Rotenone to Ether Extract
	per cent.	per cent.	per cent.
K.L. 18	4.49	29.14	15.4
K.L. 38	4.22	27.30	15.5
K.L. 90	4.37	27.11	16.1
S. 112	4.37	26.00	16.8
S. 136	2.56	24.37	10.5
S. 143	2.87	26.83	10.7
Average			14.2

It is proposed to establish the cuttings from the 7 plants with an ether extract in excess of 28 per cent. as individual clones, those from the 95 plants with an ether extract between 24 and 28 per cent. being randomized and planted as a mixed population. The cuttings from the plants with an ether extract below 24 per cent. will be discarded.

(b) *Derris malaccensis* (Tuba merah).

Stocks of this variety have been maintained for many years past in the Experimental Plantation, Kuala Lumpur. In the early part of 1932 cuttings were taken and a small plot established in the Plantation to have a supply of plants of known age.

When 25 months old ten plants were lifted at random and the "fine" or marketable roots bulked and analysed. The results of analysis, calculated on a moisture-free basis, were as follows:—

	ozs.
Average weight of air-dry marketable root per plant ...	2.2
	per cent.
Rotenone ...	1.50
Ether extract ...	21.40
Proportion of rotenone to ether extract ...	7.0

A further six plants were lifted and analysed when 33 months old with the following results.

	ozs.
Average weight of air-dry marketable root per plant ...	2.1
	per cent.
Rotenone ...	1.40
Ether extract ...	20.90
Proportion of rotenone to ether extract ...	6.5

The results of analysis of the roots at both ages are in good agreement.

Cuttings were taken and established both at Kuala Lumpur and at Serdang.

The plants were spaced approximately 3 feet apart with a similar distance between the rows.

When the plants were between 23 and 24 months old they were lifted. There were 18 plants at Kuala Lumpur and 30 at Serdang.

In regard to harvesting and preparation of the root a similar procedure was adopted to that described for *D. malaccensis* var. *sarawakensis*.

Determinations of ether extract were made in all cases. Estimation of rotenone was carried out on alternate samples with the object of obtaining a reliable indication of the extent of the variation in the proportion of rotenone to ether extract for this variety.

The methods used were those described in a previous number of this Journal (³).

The weights of marketable roots for individual plants showed considerable variation. Thus in the case of the plants at Kuala Lumpur the weights varied from 10.60 to 0.70 ozs. with an average of 4.10 ozs.; at Serdang from 15.50 to

1.10 ozs. with an average of 5.13 ozs. Table IV, in which the figures are divided into groups of 1 ounce of marketable roots, affords an indication of the frequency of variation.

Table IV.

***Derris malaccensis* (Tuba merah)**

**Weights of Marketable Roots from Individual Plants
at Kuala Lumpur and Serdang arranged
in Groups of 1 ounce.**

Marketable Roots (air-dry basis)	No. of Samples		
	Kuala Lumpur	Serdang	Total
ounces			
Above 10 ...	1	2	3
10 — 9 ...	—	1	1
9 — 8 ...	—	2	2
8 — 7 ...	—	6	6
7 — 6 ...	2	1	3
6 — 5 ...	3	1	4
5 — 4 ...	3	2	5
4 — 3 ...	2	3	5
3 — 2 ...	4	3	7
2 — 1 ...	2	9	11
Below 1 ...	1	—	1
Total ...	18	30	48

The figures for ether extract, calculated on a moisture-free basis, show a close similarity at the two places. Thus for the plants at Kuala Lumpur the figures vary from 25.40 to 18.23 per cent. with an average of 22.40 per cent.; those at Serdang from 26.84 to 14.04 per cent. with an average of 21.97 per cent. The frequency of variation is illustrated in Table V in which the figures are divided into groups of 1 per cent.

The results for rotenone confirm those obtained previously in so far as a low figure for this constituent is concerned. Both sets of results are in good agreement. Thus for the plants at Kuala Lumpur the figures vary from 1.78 to 0.32 per cent. with an average of 1.31 per cent.; those at Serdang from 2.20 to 0.44 per cent. with an average of 1.27 per cent. Table VI, in which the figures are divided into groups of 0.5 per cent., affords an indication of the frequency of variation.

Table V.

Derris malaccensis (Tuba merah)

Ether Extract of Marketable Roots from Individual Plants
at Kuala Lumpur and Serdang arranged
in Groups of 1 per cent.

Ether Extract (moisture-free basis)	No. of Samples		
	Kuala Lumpur	Serdang	Total
ounces			
27—26 ...	—	3	3
26—25 ...	1	1	2
25—24 ...	1	3	4
24—23 ...	3	5	8
23—22 ...	7	6	13
22—21 ...	4	3	7
21—20 ...	1	2	3
20—19 ...	—	1	1
19—18 ...	1	3	4
18—17 ...	—	2	2
Below 17 ...	—	1	1
Total ...	18	30	48

Table VI.

Derris malaccensis (Tuba merah)

Rotenone Content of Marketable Roots from Individual Plants
at Kuala Lumpur and Serdang arranged
in Groups of 0.5 per cent.

Rotenone (moisture-free basis)	No. of Samples		
	Kuala Lumpur	Serdang	Total
per cent.			
2.50—2.00 ...	—	1	1
2.00—1.50 ...	2	6	8
1.50—1.00 ...	4	5	9
1.00—0.50 ...	2	4	6
Below 0.50 ...	1	1	2
Total ...	9	17	26

Similarly, the figures for the proportion of rotenone to ether extract are low. In the case of the plants at Kuala Lumpur the figures vary from 7.4 to 1.4 per cent. with an average of 5.6 per cent.; those at Serdang from 11.3 to 2.0 per cent. with an average of 5.8 per cent. The figures are summarized in Table VII.

In making a selection for propagating purposes, cuttings from all plants in which the ether extract exceeds 20 per cent. on a moisture-free basis are being established as a mixed population. The figure of 20 per cent., which corresponds to approximately 18 per cent. on an air-dry basis, has been selected because 18 per cent. is the standard on which consignments of root in Singapore on an ether extract basis are usually offered.

Table VII.

***Derris malaccensis* (Tuba merah)**

**Proportion of Rotenone to Ether Extract in Marketable Roots
from Individual Plants at Kuala Lumpur and Serdang
arranged in Groups of 1 per cent.**

Proportion of Rotenone to Ether Extract	No. of Samples		
	Kuala Lumpur	Serdang	Total
per cent.			
Above 10 ...	—	1	1
10—9 ...	—	1	1
9—8 ...	—	1	1
8—7 ...	1	2	3
7—6 ...	2	3	5
6—5 ...	1	2	3
5—4 ...	2	2	4
4—3 ...	2	—	2
3—2 ...	—	4	4
2—1 ...	1	1	2
Total ...	9	17	26

(c) *Derris malaccensis* (Kinta type)

Two further series of samples of this variety, which is characterized by a moderately high ether extract, but only a low rotenone content, have been obtained from Perak. Seventeen plants were selected from one holding near Jeram Mengkuang and ten from another holding near Malim Nawar. The results of analysis of the original series of samples of this variety also taken near Malim Nawar have already been reported in this Journal ⁽²⁾.

In both cases the plants were stated to be about 18 months old.

The methods of harvesting and preparation of the root were as previously described for the other two varieties of *D. malaccensis*.

In regard to analysis, determinations of rotenone and ether extract were carried out on all samples to obtain, as in the case of *D. malaccensis*, Tuba merah, a reliable indication of the variation existing between rotenone and ether extract in this variety.

The weights of marketable roots from individual plants varied considerably. The plants at Jeram Mengkuang varied from 11.10 to 1.00 ozs. with an average of 4.47 ozs., those at Malim Nawar from 8.80 to 2.70 ozs. with an average of 5.09 ozs. A summary of the figures is given in Table VIII.

The figures for ether extract, calculated on a moisture-free basis, show a close relationship for both places. Thus for the plants from Jeram Mengkuang the figures vary from 27.40 to 16.34 per cent. with an average of 22.58 per cent.; those from Malim Nawar from 25.90 to 9.83 per cent. with an average of 22.88 per cent. The lowest result for a sample from Malim Nawar, 9.83 per cent., is of interest in view of the fact that the yield of root was about the average, the weight being 5.80 ozs. compared with an average of 5.09 ozs. for the series of plants. The results are summarized in Table IX.

Table VIII.

Derris malaccensis (Kinta type)

Weights of Marketable Roots from Individual Plants at
Jeram Mengkuang and Malim Nawar arranged
in Groups of 1 ounce.

Marketable Roots (air-dry basis)	No. of Samples		
	Jeram Mengkuang	Malim Nawar	Total
ounces			
Above 10 ...	1	—	1
10—9 ...	1	—	1
9—8 ...	1	1	2
8—7 ...	1	2	3
7—6 ...	—	1	1
6—5 ...	1	1	2
5—4 ...	2	—	2
4—3 ...	3	1	4
3—2 ...	4	4	8
2—1 ...	2	—	2
Below 1 ...	1	—	1
Total ...	17	10	27

Table IX.

Derris malaccensis (Kinta type)

Ether Extract of Marketable Roots from Individual Plants
at Jeram Mengkuang and Malim Nawar arranged
in Groups of 1 per cent.

Ether Extract (moisture-free basis)	No. of Samples		
	Jeram Mengkuang	Malim Nawar	Total
per cent.			
28 — 27	2	—	2
27 — 26	1	—	1
26 — 25	1	3	4
25 — 24	1	3	4
24 — 23	2	2	4
23 — 22	3	1	4
22 — 21	3	—	3
21 — 20	2	—	2
Below 20	2	1	3
Total	17	10	27

The results for rotenone confirm those obtained previously in so far as a low proportion of this constituent is concerned. There is, however, one abnormal sample from Jeram Mengkuang in which the rotenone amounts to 3.09 per cent. Apart from this sample, the results for the others from both places are in good agreement. Thus, in the case of the remaining plants from Jeram Mengkuang the figures vary from 1.76 to 0.11 per cent. with an average of 0.83 per cent.; those from Malim Nawar from 1.28 to 0.31 per cent. with an average of 0.60 per cent. A summary of the results in which the figures are divided into groups of 0.5 per cent. is given in Table X.

Similarly, the figures for the proportion of rotenone to ether extract are low. Apart from the single abnormal sample referred to above, the figures for the remaining plants from Jeram Mengkuang vary from 8.6 to 0.4 per cent. with an average of 3.6 per cent.; those at Malim Nawar from 5.0 to 1.6 per cent. with an average of 2.7 per cent. A summary of the results for all samples is given in Table XI.

As regards a selection for propagating purposes a similar procedure has been adopted to that followed with Tuba merah. All plants in which the ether extract exceeds 20 per cent. on a moisture-free basis are being established as a mixed population.

Table X.

Derris malaccensis (Kinta type)

Rotenone Content of Marketable Roots from Individual Plants
at Jeram Mengkuang and Malim Nawar arranged
in Groups of 0.5 per cent.

Rotenone (moisture-free basis)	No. of Samples		
	Jeram Mengkuang	Malim Nawar	Total
per cent.			
Above 2.00 ...	1*	—	1
2.00—1.50 ...	2	—	2
1.50—1.00 ...	4	1	5
1.00—0.50 ...	5	3	8
Below 0.50 ...	5	6	11
Total ...	17	10	27

* 3.09 per cent. for Sample No. 5 from Jeram Mengkuang.

Table XI.

Derris malaccensis (Kinta type)

Proportion of Rotenone to Ether Extract in Marketable Roots
from Individual Plants at Jeram Mengkuang and Malim
Nawar arranged in Groups of 1 per cent.

Proportion of Rotenone to Ether Extract	No. of Samples		
	Jeram Mengkuang	Malim Nawar	Total
per cent.			
Above 9 ...	1*	—	1
9—8 ...	1	—	1
8—7 ...	—	—	—
7—6 ...	2	—	2
6—5 ...	2	—	2
5—4 ...	1	1	2
4—3 ...	2	3	5
3—2 ...	4	2	6
2—1 ...	1	4	5
Below 1 ...	3	—	3
Total ...	17	10	27

* 13.6 per cent. for sample No. 5 from Jeram Mengkuang.

Table XII.
Summary of Results of Analysis of Marketable Roots of Different Varieties
of *Derris malaccensis*.

Variety of <i>Derris malaccensis</i>	Location of Plants	No. of Samples Analysed	Rotenone (moisture-free basis)			Ether Extract (moisture-free basis)			Proportion of Rotenone to Ether Extract	
			Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum Average
Var. <i>sarawakensis</i> ¹ do.	Kuala Lumpur	94	4.49	4.22	4.36	29.39	20.10	24.77	16.1	15.4
	Serdang	81	4.37	2.29	3.02	28.13	19.65	24.20	16.8	10.5
Tuba merah ² do.	Kuala Lumpur	18	1.78	0.32	1.31	25.40	18.23	22.40	7.4	1.4
	Serdang	30	2.20	0.44	1.27	26.84	14.04	21.97	11.3	2.0
Kinta type do.	Jeram Mengkuang	17	3.09	0.11	0.96	27.40	16.34	22.58	13.6	0.4
	Malim Nawar	10	1.28	0.31	0.60	25.90	9.83	22.88	5.0	1.6
										2.7

¹ The figures for rotenone and for the proportion of rotenone to ether extract are based on the results of three determinations in each case.

² The figures for rotenone and for the proportion of rotenone to ether extract are based on the results of nine determinations for Kuala Lumpur material and seventeen for Serdang material.

Summary.

The following observations are offered on the results of analysis which have been summarized in Table XII.

While wide variations exist in the rotenone content and ether extract of roots from the different varieties studied, the figures indicate the superiority of *D. malaccensis* var. *sarawakensis* in these respects.

As regards rotenone, the wide variations in the Serdang samples of this variety are of interest. Attention is being paid to this point in connexion with the clonal samples of root being selected there. A much greater proportion of the samples will be tested for rotenone in addition to ether extract than in previous series of analyses. This will enable the variation in the proportion of rotenone to ether extract for this variety to be determined with a much greater degree of accuracy.

While the figures for ether extract of Tuba merah and Kinta type are in close agreement, the results indicate a slightly higher proportion of rotenone in the former variety. Based on present commercial standards for sale of the roots this is of little or no consequence since, as stated previously, the rotenone content, even of the var. *sarawakensis*, is too low to admit of its being offered for sale on such a basis. At present, root of any of the three *D. malaccensis* varieties can be offered only on an ether extract basis. A much lower price is paid for root sold on this basis than for that sold on a rotenone basis, the latest Singapore figures being \$16 per picul for root sold on an ether extract basis compared with \$26 per picul for root sold on a rotenone basis.

In this connexion it must be pointed out that the present standards of rotenone and ether extract are arbitrary. As mentioned previously ⁽³⁾ correct comparative evaluations of toxicity of different species and varieties of derris can only be obtained as a result of controlled experiments with different classes of insects. Thus, it may well be that combined chemical and entomological research will reveal the suitability of even Kinta type as a specific against certain insects.

Stocks of high-grade plants from each variety are therefore being maintained to provide supplies of cuttings should the necessity arise.

In conclusion, attention might be drawn to two interesting features of the figures in regard to the effect of change of environment on toxicity and to the relationship between yield of root and toxicity. Reference has already been made in a previous paper ⁽⁴⁾ to the first of these two questions.

The comparatively close relationship between the respective figures for ether extract both of the var. *sarawakensis* and Tuba merah cultivated at Serdang and Kuala Lumpur, confirm the opinion expressed in the paper referred to above that toxicity of a mixed population of plants is not affected to any marked extent as a result of change in environment.

Further, although as a result of better soil conditions at Serdang the average yield of root per plant for var. *sarawakensis* is double that found at Kuala Lumpur the toxicities are of the same order in so far as ether extract is concerned. As explained previously, the figures for rotenone are insufficient to allow of any con-

clusion being drawn in respect of the influence of yield of root on this constituent. Further information on this point will be forthcoming, however, as a result of the study of inter- and intra-clonal variation in toxicity now in progress at Serdang.

Acknowledgments.

The writers wish to acknowledge the assistance of Mr. C. W. S. Hartley, Agricultural Officer, Perak South, and Mr. Ng Cheng Chong, Chinese Sub-Inspector of Agriculture, Kampar, in the conduct of this investigation.

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DERRIS ULIGINOSA

BY

J. N. MILSUM,

Senior Agricultural Officer.

A short note on this derris may be of interest, since it is frequently referred to as a fish poison. Further, it has also been claimed useful as an insecticide ⁽¹⁾. *Derris uliginosa* is a common shrub or climber, according to conditions, occurring on the banks of tidal rivers or mangrove swamps along the coast of Malaya. Since exact knowledge was lacking as to the value of its root for insecticidal purposes, several plants were cultivated at the Central Experiment Station, Serdang, in order to obtain information on this point.

It would appear that the correct name for this species is *Derris trifoliata*, Lour. ⁽²⁾, superseding the better-known name of *D. uliginosa*, Benth. Two Malay names are recorded, *ketui* and *setui*, (signifying the plant for a medicinal bathing of the feet) which, however, have no independent meaning ⁽³⁾. It is a slender plant with compound leaves composed of five (sometimes three) leaflets, which are leathery, dark green when mature, and hairless on both sides. The inflorescence is a numerous flowered erect raceme, with small white or pinkish flowers. The fruit is a flat, single seeded, almost circular pod. The flowers and fruit are illustrated in Ridley's Flora of the Malay Peninsula together with a description of the plant ⁽⁴⁾.

The plant grows readily from seed and thrives under ordinary cultural conditions on inland soils. It forms a low straggling shrub, unless support is available, when it climbs to a considerable height. When in flower this species presents a very ornamental appearance owing to the multitude of small white flowers emerging from the canopy of deep green foliage.

A sample of root, obtained from plants three years old grown at Serdang, was examined by the Chemical Division of the Department of Agriculture, and I am indebted to the Senior Chemist, S.S. and F.M.S., for the following results of analysis, calculated on a moisture-free basis:—

						per cent.
Rotenone	...	...	...	...	...	0.47
Ether extract	...	...	...	...	...	5.02
Proportion of rotenone to ether extract	...	...	...	...	...	9.40

The ether extract was tested for toxicarol with negative results.

It will be seen from the above figures that *D. uliginosa* produces root of insufficient toxicity to be of any commercial value.

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CACAO.

An Introductory Note

BY

O. T. FAULKNER,

Director of Agriculture, S.S. and Adviser on Agriculture, M.S.

and

J. N. MILSUM,

Senior Agricultural Officer.

As already recorded, a considerable degree of success has been obtained with a small scale trial with cacao at the Central Experiment Station, Serdang ⁽¹⁾.

Isolated cacao trees are met with throughout the country and pods are frequently exhibited at Agricultural Shows, but so far this crop has not been grown commercially in Malaya. It is proposed in this article to record the preliminary results so far obtained with cacao at Serdang and to outline very briefly the salient points of its cultivation. It should be pointed out that cacao has proved a stubborn plant to grow in Malaya but as shown later, this appears to have been due to failure to appreciate an essential requirement, *i.e.* heavy shade in the initial stages. Once this was provided the cacao made surprisingly good growth, and where the soil is suitable it appears probable that with care this crop will succeed in Malaya. The yield of commercial cacao is a matter of a balance between the natural gross yield which is encouraged by a high and continuous humidity, and the loss from black-pod disease, which tends to be increased by the same factor. So far as can be yet judged the climate of Malaya should be excellent for cacao; but since this crop is subject to several fungus diseases and insect pests, only extensive trials can prove how well the crop will do here.

Early History in Malaya.

The early history of cacao planting in Malaya has been dealt with in some detail by Mr. I. H. Burkill in his Dictionary of the Economic Products of the Malay Peninsula ⁽²⁾ and there is no necessity to recapitulate this information here. It is sufficient to state that a number of experiment plantings, over a period of many years, were tried with no success. Mr. H. N. Ridley mentions that cacao was planted in the first Botanic Garden in Singapore in 1823 by Sir Stamford Raffles, but the experiment was not continued ⁽³⁾.

Previous Trials by the Department of Agriculture.

During recent years, several trials were conducted with this crop by the Department of Agriculture with disappointing results. A small planting of *Forastero* cacao, imported from Ceylon, was made at an elevation of about 2,000 feet, at



CACAO TREE NO. 47. SHOWING RIPE PODS.



CACAO UNDER SHADE OF *Gliricidia Maculata*
AT CENTRAL EXPERIMENT STATION, SERDANG.

Gunong Angsi, in Negri Sembilan (⁴). The seedlings were planted in hill jungle, cleared of all undergrowth, and given careful attention. The plants failed, and it was evident from their behaviour that cultural conditions were quite unsuitable.

At the Central Experiment Station, Serdang, a number of experiments were undertaken, commencing in 1923. A variety of sites was selected, but in each instance either the degree of overhead shade, or cultural conditions, proved unsuitable, and the plants failed to thrive (⁵).

Present Experiment at Serdang.

During a visit to Beaumont Estate, Klang, the property of Mr. Goh Hock Huat, in November, 1933, a single cacao tree was observed growing vigorously and fruiting in profusion. The tree was situated on flat land consisting of a deep alluvial moist soil. Some shade was afforded by surrounding fruit trees. Mr. Goh Hock Huat kindly gave one of the writers seven pods from this tree and these were taken to Serdang, and a number of seedlings raised. It was stated that the tree was raised from seed originally imported from Ceylon. In order to provide a site for a further trial with cacao, a half-acre plot of land in the General Nursery was prepared for planting. Strong stumps of *Gliricidia maculata*, a leguminous shade tree, were planted throughout the area at a distance of 15 feet apart, triangular planting.

The pods contained on an average 27 seeds each and these were sown in baskets on the 14th November, 1933. The seedlings were transplanted in the half-acre plot on the 13th April, 1934, at equal distances between the shade trees, *i.e.* 15 feet apart triangular planting, requiring 108 seedlings for the plot. Soon after planting, rows of the leguminous shrub, *Crotalaria anagyroides*, were established from seed. The cacao seedlings were shaded with cut palm leaves in the first instance, but the *Gliricidia* trees and *Crotalaria* soon provided a light shade, when the palm fronds were removed. A few cacao plants died during the ensuing dry weather and the vacancies were supplied with seedlings raised from seed from two *Forastero* cacao pods obtained from Peradeniya, Ceylon.

The cacao trees made good growth and several reached the fruiting stage approximately three years from planting. During this period the overhead shade was encouraged by judicious pruning to form a complete canopy over the cacao. The accompanying illustration shows the denseness of shade afforded. Considerable trouble was experienced from a small chafer beetle, (*Apogonia cribricollis*, Burm.) which devoured the young leaves of the cacao and became a serious pest. Some success was obtained by spraying the trees weekly with a solution of lead arsenate (1 oz. lead arsenate in four gallons of water), but during wet weather the chafer continued to feed on the leaves. In 1935, a small application of calcium cyanamide (2 ozs. per tree) was dug below the soil and this appeared to have the immediate effect of reducing the depredations of the chafer. A second application was made in 1936, since when the trees have been fairly immune from the chafer pest.

Table I.
CACAO—4 Years old from Seed.
Individual Tree Crop Records, March—November, 1937.
 (108 Trees of which 89 have fruited *i.e.* 86 per cent.)

Tree No.	No. of Pods.	Total Weight Pods.	Weight per Pod.	Weight Wet Cocoa per Tree.	Weight† Dry Cocoa per Tree.	Weight† Dry Cocoa per Pod.	Average No. of Beans per Pod.	Weight† of 100 Dry Beans
		lbs.*	lbs.	lbs.	lbs.	oz.		oz.
3	6	4.72	0.79	1.12	0.45	1.20	32.3	3.72
4	12	11.06	0.92	2.19	0.88	1.17	26.2	4.46
8	6	3.27	0.54	1.02	0.41	1.08	31.2	3.46
10	4	3.01	0.75	0.77	0.31	1.22	34.0	3.59
14	1	0.72	0.72	0.14	0.06	0.90	32.0	2.81
21	26	25.25	0.97	4.07	1.63	1.00	33.0	3.03
22	9	6.09	0.68	1.55	0.62	1.10	29.4	3.74
24	7	7.68	1.10	1.50	0.60	1.37	32.9	4.17
25	4	2.02	0.50	0.52	0.21	0.82	28.0	2.93
27	19	19.19	1.01	3.64	1.46	1.22	28.3	4.31
28	19	10.03	0.53	2.16	0.86	0.73	28.6	2.55
30	1	1.03	1.03	0.22	0.09	1.40	35.0	4.00
31	2	1.52	0.76	0.23	0.09	0.75	32.0	2.34
32	13	7.68	0.59	1.41	0.56	0.69	31.4	2.20
33	28	24.41	0.87	2.70	1.08	0.62	28.1	2.21
35	10	10.07	1.01	1.59	0.64	1.01	29.0	3.48
38	26	20.06	0.77	3.47	1.39	0.85	21.4	3.97
40	4	4.00	1.00	0.75	0.30	1.20	24.2	4.96
41	31	35.15	1.13	5.87	2.37	1.21	26.0	4.66
44	24	17.98	0.75	3.59	1.44	0.96	24.8	3.87
47	16	15.11	0.94	2.89	1.16	1.16	27.5	4.22
48	23	26.21	1.14	3.16	1.26	0.88	26.7	3.30
49	2	1.72	0.86	0.28	0.11	0.90	22.0	4.09
50	45	29.66	0.66	3.44	1.38	0.49	21.3	2.30
53	25	17.81	0.71	2.73	1.09	0.70	31.8	2.20
55	1	1.19	1.19	0.19	0.08	1.20	27.0	4.45
57	36	31.55	0.88	5.37	2.15	0.96	29.7	3.23
63	25	20.22	0.81	3.08	1.22	0.78	25.4	3.70
68	61	39.14	0.64	6.29	2.52	0.66	27.2	2.43
69	1	0.78	0.78	0.11	0.04	0.70	25.0	2.80
72	5	4.05	0.81	0.41	0.16	0.52	22.2	2.34
75	1	1.00	1.00	0.22	0.09	1.40	30.0	4.67
77	36	29.10	0.81	5.05	2.02	0.89	30.0	2.97
79	1	0.97	0.97	0.16	0.06	1.00	28.0	3.57
83	9	7.51	0.84	1.42	0.57	1.01	29.6	3.41
86	4	2.62	0.65	0.56	0.22	0.90	32.2	2.80
90	4	3.62	0.90	0.59	0.24	0.95	32.2	2.95
94	1	0.91	0.91	0.12	0.05	0.80	22.0	3.64
103	1	0.81	0.81	0.16	0.06	1.00	20.0	5.00
Totals	549	448.92	32.73	74.74	29.93	37.40	1097.6	133.90
Means	14.1	11.51	0.84	1.92	0.77	0.96	28.1	3.43
West African Averages*	25	21.5	0.86	5.4	2.15	1.4	33.0	4.17

† Calculated from wet weights on the assumption that dry weight is 40 per cent. of wet weight; this factor is known to be very constant from tree to tree.

* These West African figures refer to adult trees in full bearing.

Table I records the crop harvested, together with other relevant data, from 39 trees out of a total of 108 which fruited during the period March-November, 1937. These records are of an entirely preliminary nature since only 36 per cent. of the stand of trees has so far fruited and all are much too young for their relative cropping capabilities to be judged with confidence.

It is of interest to record some ordinary standard figures for Nigerian cacao, based on data obtained by the Department of Agriculture of that country.

About 860 lbs. dry cacao per acre.

100 main-crop pods weigh about 86 lbs.

100 main-crop pods yield about 8.6 lbs. dry cacao.

300 beans main-crop weigh about $12\frac{1}{2}$ ozs.

300 beans mid-crop weigh about $9\frac{1}{2}$ ozs.

On the average, $11\frac{1}{2}$ main-crop pods yield 1 lb. dry cacao.

It appears that the cacao established at Serdang is the Forastero variety with forms ranging from typical Forastero to "Amelonado" and "Calabacillo" types, as commonly grown for commercial purposes in the chief cacao-producing countries. The average height of the trees, measured in November, 1937, was 9 feet. Although all the trees which are as yet in bearing are the progeny of the single cacao tree at Klang, already described, there is considerable variation in the fruits. The selection from this or other material for further planting will require special study, since the bean is the product marketed, and specialized knowledge is necessary before progress in this direction may usefully be made. The parent tree at Beaumont Estate, Klang, has unfortunately died since the pods were collected from it in 1933. The illustration shows a typical tree (No. 47) with pods of good size.

General Considerations.

In view of the preliminary success obtained it is proposed to commence extended trials with cacao both at Agricultural Stations and at the Central Experiment Station, Serdang. At the latter Station, arrangements are in hand to plant 10 acres during 1938.

A limited number of seeds and seedlings are available from Serdang. As already shown, crop records from individual trees are kept which will permit some initial selection of planting material.

Since the preparation of cacao beans for market is a simple process, the cultivation of this crop is considered a possible small-scale industry for Malaya.

Cultivation and other Notes.

There are a number of text books dealing with this crop, the most pretentious being that by Van Hall (⁶). Cacao is grown to some extent both in Ceylon and Java, and cultural information from these countries is likely to be of the greatest value here.

Soil and Situation.—The cacao tree develops a long tap-root, and requires a deep fertile soil such as is found in valleys and undulating land adjoining rivers. Good specimens have been seen growing on granite soil adjoining the foot-hills

of the main mountain range in Malaya. In Ceylon and Java, the cacao-growing districts occur principally at elevations between 500 and 2,000 feet.

In Trinidad, recent investigations show that the best cacao soils are almost neutral (pH 7.0) or slightly alkaline, and it is considered that most of the soils of that country would benefit by liming (7). The African cacao soils are, however, more acid, having a pH of about 5.5. Where the cacao is growing at Serdang the soil is still more acid (pH 4.6).

Planting Distance.—It is considered that a planting distance of 12 feet by 12 feet, triangular spacing, providing a stand of 350 trees per acre, may safely be employed under Malayan conditions.

Propagation.—Cacao plants are normally raised from seeds, which germinate within three weeks and form strong plants in baskets ready for transplanting in four to five months from sowing. A deep basket is advisable since the seedlings make rapid growth and form a long tap-root. Vegetative propagation is under investigation in many cacao-growing countries, and in view of the necessity for selection, is likely to receive considerable attention. The vegetative propagation of cacao and present position of botanical researches on this crop have recently been dealt with in some detail by Prof. Cheesemen of Trinidad, B.W.I. (8 & 9).

Shade.—The thornless "dadap" (*Erythrina lithosperma*) and allied species are commonly used in Ceylon as overhead shade, but at Serdang have proved useless owing to damage from boring caterpillars. A suitable tree is *Gliricidia maculata*, and this leguminous tree is recommended for local use owing to its freedom from insect attack and general adaptability. Further investigations may show other trees to be suitable for the purpose. The trees at Serdang, as already mentioned, are interplanted in equal numbers with the cacao. Although the trees have been severely pruned the shade is now becoming too dense. With close planting, cacao forms a complete canopy after four or five years and it is probable that, in Malaya, overhead shade may then be dispensed with.

The cacao plot at Serdang is surrounded on two sides by a dense bamboo hedge resulting in a high degree of humidity and protection from winds. It is evident that the shade and humid conditions are mainly responsible for the success so far obtained.

Yields.—These vary considerably in different countries according to the variety of the cacao grown and other factors. Whereas in Trinidad the average yield is stated to be 260 lbs. cured beans per acre, in Nigeria it is estimated to be three or four times this figure. The low yield in the former instance is largely due to trees becoming old and less prolific, whereas in West Africa the trees are considerably younger and more thickly planted.

In Ceylon, a good average yield from mature areas is considered to be 4 to 5 cwts. Cacao reaches full bearing after about seven years and may continue in production until eighty or more years old. The yield per acre generally begins to fall after about thirty years, but whether this need occur if the trees are properly cared for is still a debatable question. An average of twelve pods to one pound of cacao is the accepted standard in Trinidad, but size of pods and proportion

of beans to pods are variable factors. The size of bean is an important commercial character. Thus the West African main crop cacao, with 23 or 24 beans to the ounce realizes a very considerable premium over the off-season production with 30 to 32 beans to the ounce.

Harvesting.—This should be carried out once a month whenever there is any crop on the trees. Any considerable delay in harvesting results in much loss from black-pod disease and from the beans germinating in the pod. In harvesting it is undesirable to pick obviously green and unripe pods, because the presence of a very large proportion of such cocoa makes satisfactory fermentation impossible; but it is better to pick all pods that are nearly ripe, than to err in the other direction, for nearly ripe beans, fermented in a mixture with ripe ones, yield a satisfactory product, while ripe cocoa left on the trees may be damaged or germinated before the next round. The pods are generally split in the field, the shells left there and only the wet beans carried to the store. It is good practice to bury the shells, although investigations in several countries have failed to prove any definite connexion between heaps of shell left in the field and the spread of pod disease.

Preparation.—This consists of fermenting and drying. During the fermentation process the bitter and astringent taste of the raw bean largely disappears and the "cocoa" or "chocolate" flavour develops. When dry, a cut fermented bean is brown in colour and friable in texture, whereas a cut unfermented bean is either slaty both in colour and texture, or purple in shade and cheese-like in texture. The fermentation of the raw bean is an essential process in the preparation of a good commercial product, and numerous attempts to replace it by more artificial processes have failed to give satisfactory results. The process is not inconvenient to the grower for it shortens the time taken in drying. With ordinary Forastero cocoa the period of fermentation, if the cocoa is intended for sale in England or America, should be not less than six nor more than seven days. This period of fermentation produces a bean that is light brown when cut and not very brittle. The continental manufacturer generally prefers, in Forastero cocoa, a very dark and brittle bean, such as is produced by nine days' fermentation—a type of bean which is disliked by all English manufacturers. The fermentation can be carried out in any form of basket, box or wooden-sided tank, according to the quantity to be handled, though it is hardly possible to prepare a first-quality product in quantities of less than about 40 lbs. (dry weight). The cocoa should be well covered with banana leaves or old sacking to assist the retention of the heat of fermentation. One turning-out and mixing of the cocoa during fermentation is essential, and two are preferable. The first mixing should be done not less than 60 hours, after the beginning of the process. If a second turning is given it should not be carried out until a further period of about 48 hours has elapsed. In the mixing process the cocoa must be turned out of the box or basket and refilled into it or into a similar one: a sufficiently good mixing cannot be obtained by stirring. Failure to turn and mix adequately will result in a proportion of mouldy beans.

After fermentation, the beans are sun-dried on a cement barbecue or on a tray or mat. In this process the beans should be spread in a layer not more than about two or at the most three inches thick. During the first two days' drying the beans should be stirred or turned several times. Provision must be made for covering the cocoa at night or during rain without heaping it or bagging it, for until it has been dried for one or two days it cannot be bulked for more than a very short time indeed without becoming infected with moulds. If the fermenting and drying processes are properly carried out, the cocoa, once it is thoroughly dry, can be kept for quite considerable periods in even somewhat humid conditions without deteriorating. If it is once infected with mould during fermentation or drying, it can hardly be prevented from rapid deterioration during storage and transit. During the process of fermenting and drying there is a loss of weight of 58 to 60 per cent. Before the cocoa is bagged for sale any black beans (*i.e.* beans from pods badly damaged by black-pod disease) should be removed, together with any germinated beans and any completely flat undeveloped ones, and any pieces of "placenta".

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CACAO, COCOA AND COCA AND ALLIED WORDS.

There is sometimes confusion between these names, and we have heard of a planter (not in Malaya) who introduced and planted an area of coca under the impression that it was the plant from which a beverage is obtained.

Cacao, cocoa, coco, and the now obsolete cacao, are synonymous for the plant *Theobroma cacao*, from the seeds of which cocoa and chocolate are prepared. The term cocoa (according to the Oxford Dictionary) originated, apparently by accident, in Dr. Johnson's Dictionary.

The use of the spelling cacao in relation to the tree, if slightly pedantic, is at least correct, since it is part of the botanical name of the tree. To use this spelling for the prepared product, which is always spoken of as cocoa, is the extreme of pedantry.

Coca is a plant, *Erythroxylon coca*, the dried leaves of which, with powdered lime, are chewed to appease hunger and to stimulate the nervous system. It is illegal to plant *Erythroxylon coca* in Malaya.

The coconut, cocoanut or cokernut is the fruit of the coconut palm (*Cocos nucifera*).

The tuber of an Araceous plant, *Colocasia esententa* or taro-plant is cultivated in many tropical countries as an article of food, and is known as kēladi in Malaya. Coco-yam is a common name for the same plant.

Ed. M.A.J.

Miscellaneous.

USE OF CRUDE OIL TO PREVENT DAMAGE BY CRABS.

For the development of an area of land which is inundated by brackish water at every spring tide, it is necessary to build a bund along the river edge. Land of this nature situated at the mouth of the Perak River has been opened up by the writer.

The building of the bund was done by digging a shallow drain or "key" 1 foot deep and 12 feet wide, thereafter earth being carried from a drain dug at a distance of 120 feet away and parallel with the bund. The latter was built to a height of 5 feet.

The land was riddled by crab holes and as something had to be done to combat the crabs several poisons were tried with negative results. Finally ordinary crude oil was tried and it was found that when a small quantity of this was poured into a hole, there was no recurrence of mud being pushed up from underneath. The writer is unable to state whether the dredger crabs are killed or simply deterred by the oil.

It may not be generally known, except by those who have experience of crab land, that the holes are made and the mud pushed up from a depth of several feet by the 'dredger crabs' or 'udang getah'. The land crabs thereafter take possession and use the holes as hiding places.

On the shallow drain being dug for the bund, to each hole—these were every foot or two apart—was applied half a cigarette tin of crude oil. The surface of the drain was sprayed with the oil and then the bund built. The oiling was done each day as the bund work proceeded.

From the point of view of building this bund the experiment was entirely successful. If the contractor omitted to put down the oil as instructed (incidentally he did do so on one occasion and had to remake the whole of his previous day's work) the following day the new bund would be riddled with holes, but properly carried out, only an occasional hole appeared.

After the bund had been completed, a labourer was sent round one day each month to put oil into and seal with mud, any hole which appeared. These sealed holes never seemed to be opened up again. For this upkeep work about 8 gallons of oil sufficed for about 60 chains of bund per month.

P. C. FISHER.

Abstract.

THE EXPORT CROPS OF THE NETHERLANDS INDIES IN 1936.

Bulletin No. 149 of the Central Bureau of Statistics of the Netherlands Indies.

The year 1936 was a turning point for the Netherlands Indies in respect of the total value of its exports and of the value of the exports of agricultural products, which rose to a total of Gs. 362 millions from a total of Gs. 294 millions in 1935. The quantities exported were respectively 3,281,000 and 3,275,000 metric tons* and the average values per ton respectively Gs. 110 and Gs. 90.

Of the total value of the 1936 exports of agricultural products 63.3 per cent. was estate produce and 36.7 per cent. native produce. For the last 12 years this proportion has been fairly stable.

Expressed as a percentage of total world exports of important agricultural products the 1936 exports from the Netherlands Indies were: cinchona 90 per cent., kapok 77 per cent., pepper 92 per cent., rubber 36 per cent., copra 27 per cent., agave-fibre (sisal) 22 per cent., tea 18 per cent., oil palm products 17 per cent.

Cane Sugar.

The area planted with pedigree cane to serve as planting material was 7,250 hectares† and the crop from 1,787 hectares of this area had to be milled. This compares favourably with the 1935 figures of respectively 4,568 and 1,820 hectares. Total production of cane sugar was 574,710 tons and total exports 880,515 tons, further reducing old stocks. Cane sugar production for the year 1936-37 is estimated to be 6.6 per cent. of the world's total cane-sugar production; for 1934-35 it was at its lowest point at 3.1 per cent.

Native production for home consumption increased slightly, the planted area being 12,909 hectares as against 11,507 hectares in 1935.

Rubber.

The estate planted area was 595,959 hectares, 537,376 hectares of which were in bearing. A total area of 12,619 hectares of old rubber was cut down, and 13,086 hectares were planted with superior material. Of the total area planted, 157,449 hectares (26.4 per cent.) are budded rubber, fully 90 per cent. of which was planted before 1934.

The extent of the native-owned planted area has now been approximately determined. For Java the only figure given is one of nearly 8 million trees, 60 per cent. of which is tappable. For the Outer Provinces the figures are: 788,438 owners, a total of 582,365,725 trees, of which 232,374,010 are being tapped and 209,343,934 are tappable but not yet tapped, whilst 140,647,781 trees are not

* Throughout this abstract, "ton" refers to the metric ton of 2,200 lbs.

† 1 hectare = 2.472 acres.

tappable. The total planted area is estimated at 681,187 hectares, of which 629,983 are tappable and 51,154 not tappable. The tappable area itself is sub-divided into five classes:—

I Good	IIa Fairly Good	IIb Fairly Bad (in hectares)	III Bad	IV Neglected
27,327	111,919	253,630 (per cent.)	135,380	101,717
4.3	17.8	40.3	21.5	16.1

The registration figures probably are somewhat on the low side and liable to correction in the course of 1937.

After the revision in 1936 the total basic production quota (in metric tons) for the Netherlands Indies was fixed at:—

1934	1935	1936	1937	1938
357,632	406,400	508,000	528,320	548,640

of which were allotted to estates and to natives respectively:—

208,532	236,968	262,442	276,660	287,324
149,100	169,432	245,558	251,660	261,316

Total exports in 1936 were (in metric tons):—

Estates	Native	Total
163,983	151,626	315,609

against allowances of:

164,026	153,474	317,500
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The quality of the native product exported further greatly improved. Whereas before the introduction of restriction the figures for first, second and third quality were respectively about 16½, 3 and 80½ per cent., those for 1936 were respectively: 84.6, 0.3 and 15.1 per cent. The output of the remilling factories has correspondingly increased steadily from 11,384 tons in 1932 to 53,616 tons in 1936.

Coffee.

The planted estate area was 112,696 hectares, 82½ per cent. of which is in Java, and the area of native plantations in Java was 23,807 hectares; the area of the native plantations in the Outer Provinces is not known. Estate production was 50,388 tons and the export of native-grown coffee from the Outer Provinces was 74,530 tons, 91 per cent. of which came from Sumatra. The bulk of the production is Robusta coffee.

Tea.

The planted estate area was 138,750 hectares, 76 per cent. of which is in Java, and over 98 per cent. in bearing. No native tea is grown outside Java. In Java the planted native area was 66,243 hectares, 97 per cent. of which was in bearing. The total quantity of estate produce, including 12,629 tons dry weight of purchased native-grown leaf, representing a value of Gs. 3,291,931, was 75,581 tons.

Tobacco.

The particular features of this cultivation and of the preparation for export were fully described in Volume XXII (1934) of this Journal.

The crop of the superior grade of leaf for cigar wrappers, which is confined to estate cultivation on the East Coast of Sumatra, amounted to 13,712 tons. In Java and Madura, estate cultivation of cheaper grades and of European-managed curing of purchased native-grown leaf produced a crop of 14,726 tons of "leaf tobacco" and of 17,124 tons of crude tobacco.

Further there is a large native output for home consumption and its export surpluses in 1936 were 17,141 tons for Java and 1,288 tons for the Outer Provinces.

Cinchona.

The 1936 estate production of dried cinchona bark was 9,879 tons. Export of native-grown bark was 99 tons dry weight, and the Bandoeng quinine factory further purchased nearly 11 tons dry weight of native-grown bark of an average percentage of 4.92, and a quinine equivalent of 524 kilograms. Native cultivation is increasing.

Oil Palm Products.

Of a total planted area of 79,318 hectares, 67,885 hectares are in bearing. Production amounted to 175,236 tons of oil (palm oil and kernel oil together) and 36,135 tons of kernels. Exports were respectively 172,366 and 36,802 tons. Of the total area 94 per cent. is in North Sumatra, where the yield of palm oil per hectare in bearing is now 2,630 kilograms.

The Netherlands Indies in 1936 contributed 36.7 per cent. to the world's exports of palm oil and 4.85 per cent. of kernels.

Coconuts.

The estate area in bearing is: Java 6,018 hectares and Outer Provinces 31,664 hectares, together producing 29,578 tons copra equivalent. In addition to this, native-grown produce was bought equivalent to 722 tons of copra. Total estate production was 30,300 tons.

Though native production in Java and Madura is large, domestic consumption in 1936 required an import surplus of 26,875 tons copra-equivalent. Native coconut-growing in Java and Madura is estimated to have produced 153,900 tons of copra for the local oil mills. This figures does not include domestic consumption of nuts for culinary purposes and for oil extraction in the small native village oil mills.

The export surplus from the Outer Provinces in 1936 was 504,278 tons, including 26,234 tons estate produce.

The total 1936 export of copra, oil and coconuts combined from the Netherlands Indies amounted to 518,491 tons copra equivalent.*

Essential Oils.

The estate area planted with citronella was 7,038 hectares of which 6,517 hectares were in bearing. The native area in Java is stated to have been 14,451 hectares, of which 13,107 hectares were in bearing. A large total of small scattered native fields, the produce of which is distilled in the villages, always remains outside official statistics; exports of oil always greatly exceed the known production. For 1936 the figures were respectively 1,603,003 and 569,605 kilograms.

Exports of other essential oils in 1936 were (in kilograms):—cajuput oil 56,021, vetiver oil 16,300, patchouli oil 13,358.

Hard-Rope Fibres.

Chiefly sisal, grown on estates. The total export in 1936—not including refuse—was 76,627 tons, compared with 92,346 tons in 1935.

Kapok.

This crop is almost entirely native-grown and the cleaning of the fibre from the pod is largely a village industry. The bulk of the exports come from Java. Total 1936 exports were:—

Fibre	Seeds	Oil	Oilcake
	(in metric tons)		
28,439	21,702	2,981	23,529

of which estate produce was:—

2,561	4,859	—	—
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Only *Ceiba pentandra* L. Gaertn. is cultivated.

Pepper.

Cultivation is almost entirely in the hands of native and Chinese growers. The 1936 exports were:—

	Black	White	Total
	(in metric tons)		
Sumatra ...	58,620	1,606	60,226
Banka and Billiton ...	932	13,036	13,968
Borneo ...	134	3,254	3,388
	58,686	17,896	77,582

* Basis of conversion: see *Malayan Agricultural Journal* Vol. XXV (1937) No. 2, p. 72.

as against a total of 60,631 tons in 1935. As in former years black pepper accounts for the bulk of the increase.

Tapioca.

This crop is almost exclusively grown by natives in Java for home consumption and only a small surplus is available for export in its various forms.

In 1936 the planted native area of 870,000 hectares as well as the harvested crop of 7,481,000 tons of fresh tubers considerably exceeded the 1931-1935 averages of respectively 733,400 hectares and 6,020,200 tons of tubers. Owing to this a surplus of about 849,000 tons of tubers was available for export, equivalent to 11.35 per cent. of the crop instead of the 1931-1935 average of 7.75 per cent.

To the figures for planted area and production those relating to estate cultivation for flour manufacture have to be added, but they are relatively insignificant.

The exports of tapioca products in 1936 were: dried tubers 46,237 tons; dried and ground 61,697 tons; flour 158,359 tons; flake and siftings 6,689 tons; pearl and seeds 12,461 tons; fibre residue 4,169 tons.

Coca.

This is exclusively an estate crop and is exported as leaf. Production in 1936 was 143,048 kgs. of leaf.

Gambier.

This crop is mostly native grown in the Outer Provinces which in 1936 exported 13,505 tons, 5,586 tons of which were consumed in Java. Estate production is stated to have been 3,379 tons.

Arecanuts.

This is entirely a native crop. In 1936 exports from Java were 6,718 tons and from the Outer Provinces 47,067 tons, total 53,785 tons.

Nutmegs.

No reliable figures for planted area, production and home consumption are available. The 1936 exports were: shelled nuts 2,078 tons, unshelled nuts 2,114 tons and mace 665 tons; they came chiefly from the Banda Islands group *via* Menado in Northern Celebes.

Cloves.

Production in the Netherlands Indies in 1936 was more than two and a half times the fairly steady average of 1932-35, and exports from the producing regions rose to 1,659 tons, of which, however, only 396 tons went to foreign countries. Java took 1,058 tons and in addition to this another 5,116 tons from foreign countries, chiefly Zanzibar.

Rice.

Java has always had an import surplus of rice in spite of its own huge production, but in 1936 with a record crop of 3,992,690 tons of husked rice from a record planted area of 3,873,000 hectares it has for the first time had an export surplus of 96,200 tons, most of which went to the Outer Provinces.

The Outer Provinces in 1936 had a net import surplus of 306,044 tons of husked rice, so that the net import surplus of the whole of the Netherlands Indies in 1936 was 209,844 tons for a population of over 60 millions. Bali, Lombok and Celebes always have a surplus available for export to other parts of the Outer Provinces.

Maize.

Though a native crop, formerly practically entirely for home consumption, exports to foreign countries from Java as well as from the Outer Provinces are increasing.

Of Java's 1936 crop of 2,220,300 tons of husked grain from a planted area of 2,229,000 hectares, 134,178 tons were exported to foreign countries as against 62,697 tons in 1935.

The Outer Provinces in 1936 exported 39,152 tons to foreign countries as against 20,584 tons in 1935. Practically all of this came from Celebes.

Groundnuts.

Exports to foreign countries in 1936 amounted to 47,035 tons from Java and to 3,134 tons from the Outer Provinces.

Soya Beans.

In 1936 Java for the first time had an export surplus of 3,756 tons. The 1936 crop was 247,400 tons as against 202,700 tons in 1935. In 5 years the Java production has been doubled. In the Outer Provinces, too, production is increasing and imports from foreign countries decreasing.

Total imports from foreign countries into the Netherlands Indies in 1936 were 5 per cent. of the imports in 1932.

Sago.

In 1936 exports to foreign countries were 47,628 tons mainly from the East Coast of Sumatra and Rhio Islands.

Derris.

Increased domestic consumption is thought to account for the decrease in the exports which in 1936 were 177 tons of dried roots against 318 tons in 1935. The planted estate area in 1936 was 1,070 hectares of which 318 hectares were in bearing.

Miscellaneous Crops.

The 1936 exports of a number of minor crops were as follows:—

				Tons
Cocoa	...	...	...	1,657
Cinnamon	...	...	...	2,742
Castor Oil Seed	...	...	...	4,278
Sesamum (dry seed)	...	...	...	2,341
Candlenuts	...	...	...	170
Potatoes	...	...	...	3,703
Chillies	...	...	...	1,992
Onions	...	...	...	1,770
Vanilla	...	...	...	16,421 (kilograms)
Benzoin Gum	...	...	...	2,035
Fresh Vegetables	...	...	...	8,454
Dried Vegetables	...	...	...	2,992
Fresh Fruit	...	...	...	7,387
Tamarind	...	...	...	3,620
Canned Fruits	...	...	...	301
Kratok (dry seed)	...	...	...	2,937
Cubebs	...	...	...	135

L. A. J. R.

Review.

A Note-Book of Tropical Agriculture.

By R. Cecil Wood, M.A., Dip. Agric. Cantab. Published by the Imperial College of Tropical Agriculture, Trinidad, British West Indies, 2nd edition, 1937. 147 pp. Price 5 shillings post free.

This book consists principally of a compilation of facts and figures relating to tropical agriculture. The first edition, which was published early in 1933, has been exhausted and opportunity has been taken in printing the second edition to make a few alterations in the text. The author, Professor R. C. Wood was formerly in the Indian Agricultural Service and is now Professor of Agriculture at the Imperial College of Tropical Agriculture, Trinidad.

The first five sections of the book deal with Weights and Measures, Mensuration and Surveying, Buildings and Roads, Machinery, and Labour. The next three sections are allotted to Soils, Manures, and Crops, followed by other sections on Foods and Feeding, Livestock and Dairying. A section is devoted to Recipes, while the last few pages of the book are taken up by formulae for working out statistical analyses.

A feature of the publication is that the text is interleaved with blank pages for the purpose of making additional notes when desired.

This is an extremely useful little book and should form a handy reference for all those connected with tropical agriculture.

B. B.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

December, 1937.

The Weather.

The rainfall approximated to normal for the month in Kedah, but was below average throughout Province Wellesley, Perak and the inland areas of Selangor and Pahang. Precipitation was normal for the month in Negri Sembilan but was appreciably higher than usual in Malacca, on the coast of Klang and Kuala Langat in Selangor and at Pontian on the west coast of Johore. The Bernam peninsula of Selangor did not share in this heavier coastal rainfall, the precipitation there being lower than usual for December.

The month was a very wet one throughout Kelantan, especially during the first week, and total rainfall figures for the month are considerably above average at all stations from which records were received.

Remarks on Crops.

Rubber.—There was a slight rise in price of the commodity at the beginning of the month which appears to have been maintained in some places but not in others. A general quotation given for smoked sheet is \$30 a picul.

There was a general increase in the price offered for coupons as compared with the previous month with a corresponding decrease in the price for rubber not covered by coupons. Some of the quotations for coupons per picul equivalent are:—Penang, \$13 as compared with \$6 for November; Perak North, \$15.80 as compared with \$12.80; Perak South, \$15 to \$18 as compared with \$10; South Johore, \$10.50 to \$20 as compared with \$6.35 to \$11.

It is recorded that in Kuala Selangor, cabinet-smoked rubber is commanding 80 cents more a picul than is paid for rubber smoked in dealers' or other large smoke houses.

Padi.—Harvesting has commenced in Kedah in some areas and the yields being obtained tend to confirm the fears previously expressed that the crop will be appreciably lighter than that of last season. Prospects are similarly not very bright for Province Wellesley.

Reports from Krian state that the appearance of the crop has improved considerably and that there is some likelihood of yields in the north-west of the District approximating to those of last season. Similar improvement is noted also as regards the crop in other parts of the District, but planting was generally late

and past experience of late planted padi in this District rather tends to induce a somewhat less optimistic view of the situation than is given in the December report from this Circle. In North and Central Perak a fair average crop is anticipated. In the Sungei Manik area of Perak prospects remain good for Stage I but rather less promising for Stage II.

In Selangor, transplanting is still in progress in the Panchang Bedena and Tanjong Karang areas. Harvest will consequently be very late. Satisfactory yields are being obtained generally in Pahang. In Kelantan, a better harvest is expected from the wet padi than for last season. The dry padi has also grown better than last year and is expected to produce better yields than last season. It is estimated, however, that the planted acreage of dry padi is below that of last season, so the total yields of dry padi for the State may not exceed those of last year.

Agricultural and Padi Stations.

Agricultural Stations.—There is a belief general amongst Chinese vegetable growers that prawn dust and soya bean meal are much more effective as a vegetable fertilizer if soaked in water for a considerable time before application. Preliminary experiments at Ayer Itam Station, Penang, gave just as high a yield from Chinese radish treated with dry prawn dust and bean meal as from plants fertilized with the soaked products. The experiment is being continued.

At Kuala Kangsar Station some 1,000 fruit seedlings were budded and included the budding of a number of durian seedlings with budwood from the famous Datoh Nana tree in Malacca.

At Cheras Station in Selangor a limited number of cuttings of Derris Changi 3 received from the Central Experiment Station, Serdang, were cut in half before being planted. Although most of these cuttings consisted of only three nodes practically all of them formed roots and are growing satisfactorily.

At Tanah Rata Station, Cameron Highlands, the work of providing extra withering accomodation for tea by erecting a second storey to the factory has been completed and the new factory came into operation on December 2nd. The following extraordinarily satisfactory weights of chickens are reported from this Station in this month's report:—

	Batch 1.		Batch 2.		Batch 3.	
	(age 14 weeks)		(age 11 weeks)		(age 7 weeks)	
	Cockerels	Pullets	Cockerels	Pullets	Cockerels	Pullets
	21	17	24	17	17	36
Mean weight	4½ lbs.	3 lbs. 1 oz.	2 lbs. 13 ozs.	2 lbs. 10 ozs.	2 lbs. 10 ozs.	1 lb. 5 ozs.

Padi Stations.—Several reports contain reference to the very much better growth and higher tillering exhibited on the plots that received the heavy phosphate manuring last season, as compared with the control plots. This experiment is

being retained this year for determination of residual effect and all plots in the experiment have received three dressings of ammonium sulphate at specified intervals.

An unusually good crop for the Station is being produced at Kuang Station in Selangor this season and *penyakit merah* is hardly noticeable, being in evidence in only very small isolated patches. The cause of this affection, a noticeable symptom of which is a reddening of the leaves, is still undetermined and the fact that it is in evidence in a particular spot in one season, whereas padi growing in the same spot in the succeeding season may show no sign of it, is difficult of explanation. Dr. Wulff, on his recent visit to Malaya, stated that there is a similar phenomenon in the Netherlands Indies, the cause of which has not yet been determined.

DEPARTMENTAL NOTES.

Transfer.

Mr. J. N. Milsum, Senior Agricultural Officer, was transferred from the Central Experiment Station, Serdang, on the 3rd January 1938 to Taiping, where he will officiate as State Agricultural Officer, Perak.

Leave.

Mr. C. W. S. Hartley, Agricultural Officer, has been granted 123 days' leave on full pay with effect from 4th December, 1937, inclusive.

Mr. J. L. Greig, Agriculturist, returned from leave on 30th December, 1937.

Mr. C. H. Burgess, Agricultural Officer, Krian, has been granted 179 days leave from 4th January to 1st July 1938 inclusive. Mr. E. J. H. Berwick, Agriculturist, has assumed duty in the post.

Mr. J. W. Jolly, acting State Agricultural Officer, Perak, proceeded on 232 days leave on the 15th January 1938.

Malayan Agriculture at the Empire Exhibition.

In connexion with the above Exhibition which will be held at Glasgow from May to October 1938, Malayan agriculture will receive the prominence which is due to its importance. A large and very beautiful diorama depicting the interior of a pineapple factory is practically complete. A companion diorama will shew a rubber estate with real rubber trees from which latex flows, and life-size models of labourers engaged in tapping and carrying latex. The pineapple diorama will be supported by the staging of different brands of canned pineapples and by regular cookery demonstrations, while additional rubber exhibits will include a model factory and examples of the more important forms in which rubber is exported.

The Department of Agriculture is engaged in the preparation of exhibits concerning the following crops:—oil palms, coconuts, rice, arecanuts, tapioca, spices, derris and nipah.

Statistical. MARKET PRICES.

December, 1937.

Major Crops.

Rubber.—With the reduction in quota notified on the 30th November, the market improved in the early part of December, but fell heavily in the second half of the month. Spot loose opened in Singapore at 24 $\frac{7}{8}$ cents per lb. and improved to 25 $\frac{5}{8}$ cents on the 4th December; it weakened to 24 $\frac{1}{2}$ cents on the 13th, and, with minor fluctuations, fell steadily to close at 22 $\frac{1}{8}$ cents.

The average price for the month for No. 1. X. Rubber Smoked Sheet was 24.16 cents per lb. as compared with 23.20 cents in November. The London average price was 7.27 pence per lb., and the New York price 14.97 cents gold, as compared with 7.06 pence and 14.43 cents gold in November.

Table I shews prices paid during the month at three centres for small-holders' rubber.

Table I.
Weekly Prices Paid By Local Dealers for
Small-Holders' Rubber, December, 1937.
(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.				Kuala Kangsar, Perak.				Batu Pahat, Johore.				
	2	9	16	23	8	15	22	29	1	8	15	22	29
Smoked sheet	29.40	30.82	29.00		30.14	29.00	29.00	27.50				28.00	27.50
Unsmoked sheet	27.69	29.00	27.00	27.00					26.40	28.00	27.00	26.30	24.70
Scrap	18.00	18.00											

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$0.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases at Kuala Kangsar on the 1st, and at Kuala Pilah on the 30th December.

Palm Oil.—The market for palm oil remained steady at a lower level, and kernels shewed a slight improvement. Table II gives the quotations during the month.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1937.		Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
		per ton	per ton
December	3	£ 17. 0. 0	£ 10. 2. 6
	„ 10	17. 0. 0	10. 7. 6
	„ 17	17. 0. 0	10. 12. 6
	„ 24	17. 0. 0	10. 15. 0
	„ 31	17. 0. 0	10. 10. 0

Copra.—The Singapore market recovered ground during December but the average prices, sun-dried \$4.81, mixed \$4.54 per picul, were lower than those of the previous month, \$4.85 and \$4.60 respectively. The sun-dried grade opened at \$4.50 per picul, improved to \$5 on the 17th December, but fell to close at \$4.75.

Copra cake fell to \$1.80 per picul, the average price for the month being \$2.15 per picul as compared with \$2.40 in November.

Rice.—The average wholesale Singapore prices of rice per picul in November were as follows:—Siam No. 2 (ordinary) \$4.12; Rangoon No. 1 \$3.92, Saigon No. 1 \$3.82, as compared with \$4.39, \$4 and \$3.97 in October and \$4.06, \$3.47 and \$3.72 respectively in November 1936.

The average retail prices in cents per gantang of No. 2 Siam rice in November were:—Singapore 29, Penang 36, Malacca 32, as compared with 31, 35 and 34 respectively in October.

The average declared trade value of imports during November was \$4.09 per picul, as compared with \$4.09 in October and \$4.20 in September.

Padi.—The Government Rice Mills, Perak, continued to pay \$2 per picul for padi during December. Retail prices ranged from 7 to 15 cents per gantang.

Pineapples.—There was no further change in the low prices at present ruling: they were (per case): G.A.Q.: Cubes \$2.70, Sliced Flat \$2.65, Sliced Tall \$2.80; Golden Quality: \$2.85, \$2.80 and \$2.95 respectively.

Prices of fresh fruit per 100 during December were as follows:—Selangor 45 to 50 cents, Singapore 70 cents to \$1.20, Johore 1st quality 60 to 80 cents, 2nd quality 40 to 50 cents, 3rd quality 20 to 35 cents.

Beverages.

Tea.—During December eight consignments of Malayan tea were sold on the London market. Two consignments were of upland tea and were sold at 1s. 2d. per lb., while the lowland tea averaged from 1s. 0½d. to 1s. 1¼d. per lb.

Average London prices per lb. during December for consignments of tea from other countries were as follows:—Ceylon 1s. 2.89d., Java 1s. 0.69d., Indian Northern 1s. 1.81d., Indian Southern 1s. 2.15d., Sumatra 11.59d.

The latest Colombo average prices available, quoted from *The Weekly Tea Market Report*, 31st December 1937, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.: High Grown Teas 80 cents, Medium Grown Teas 73 cents, Low Grown Teas 68 cents.

Coffee.—Palembang coffee shewed a slight improvement in December averaging from \$10.80 to \$10.95 per picul. Sourabaya was slightly lower at \$13.10 to \$14.10 per picul.

Prices in Singapore of other varieties of coffee were as follows (per picul):—Liberian \$14.50 falling to \$14; Excelsa \$11 falling to \$10; Robusta \$8 falling to \$7.

Spices.

Arecanuts.—The following was the range of Singapore average prices per picul during December:—Splits \$5.05 to \$8.35; Red Whole \$5.35 to \$6.40; Sliced \$10.25 to \$12.65.

The averages of the Singapore Chamber of Commerce quotations per picul were:—Best \$3.36, Medium \$7.75, Mixed \$7.44.

Pepper.—The market was stagnant during December, and average prices per picul were:—Singapore Black \$8.31, Singapore White \$13.50, Muntok White \$14, as compared with \$8.75, \$13.75 and \$14.25 respectively in November.

Nutmegs.—The price for both 110's and 80's improved to \$42 per picul, the average for the month being \$41 per picul as against \$40 in November.

Mace.—Prices fell in the second half of December and averages per picul for the month were: Siouw \$105, Amboina \$86.50, as compared with \$110 and \$88 respectively in November.

Cloves.—Quotations continued nominal at \$40 per picul for both Zanzibar and Amboina.

Cardamoms.—Green cardamoms were quoted in the Ceylon Chamber of Commerce reports for December at Rs. 0.90—Rs. 1.25 rising to Rs. 1.10—Rs. 1.28.

Miscellaneous.

Derris (Tuba Root).—The market remained dull and prices continued unchanged, roots sold on rotenone content at \$26 per picul, and on ether extract at \$16 per picul.

Gambier.—Block fell to \$8 per picul as compared with an average price of \$8.50 in November. No. 1 Cube was quoted throughout at \$15.50 as against \$15.31 per picul in the previous month.

Tapioca.—Prices were lower in December, and remained unchanged throughout the month at the following levels:—Flake Fair \$4.50, Seed Pearl \$4.80, Medium Pearl \$5.20 per picul, as compared with \$4.78, \$5.02 and \$5.32 in November.

Sago.—Prices were again lower in December. Pearl, Small Fair, averaged \$4.11 per picul, and Flour, Sarawak Fair, \$2.46 per picul, as compared with \$4.89 and \$2.89 respectively in November.

Tobacco.—The range of prices per picul for dried leaf was as follows:—1st quality \$28 to \$50, 2nd quality \$17.50 to \$44, 3rd quality \$8 to \$36. Prices for prepared tobacco were as follows:—Kelantan \$90 to \$100, \$70 to \$80, \$55 to \$60; Negri Sembilan \$60 to \$65, \$53 to \$58, \$45 to \$55; Johore (Java tobacco) \$40 to \$140.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for imported coffee and arecanuts by the Lianqui Trading Company of Singapore, and derris prices by Messrs. Kohyei & Co., Singapore.

1 picul = 133½ lbs. The Dollar is fixed at two shillings and fourpence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C. 2

GENERAL RICE SUMMARY*

November, 1937.

Malaya.—Imports of foreign rice during November were 59,300 tons† and exports 17,045 tons, net imports being 42,255 tons as compared with 48,187 tons in 1936. Net imports from January to November totalled 531,703 tons as compared with 488,732 tons in 1936.¶

Of the November imports, 42 per cent. were consigned to Singapore, 22 per cent. to Penang, 7 per cent. to Malacca, 24 per cent. to the Federated Malay States, and 5 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 35,551 (60.0), Burma 20,663 (34.8), French Indo-China 2,360 (4.0), other countries 726 (1.2).

Of the exports during November 72 per cent. were consigned to the Netherlands Indies and 28 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 12,154 (71.3), Burma 3,671 (21.5), French Indo-China 1,118 (6.6), parboiled 60 (0.4), local production 42 (0.2).

India and Burma.—Foreign exports during January to October totalled 657,000 tons, as compared with 1,163,000 tons in 1936, a decrease of 43.5 per cent. Of these exports 3.9 per cent. were to the United Kingdom, 5.8 per cent. to the Continent of Europe, 29.1 per cent. to Ceylon, 21.6 per cent. to the Straits Settlements and the Far East, 39.6 per cent. to other countries. The corresponding 1936 percentages were 3.5, 16.0, 29.3, 21.7 and 29.5.

Siam.—Exports of rice and rice products from Bangkok during September were 80,370 tons, as compared with 153,183 tons in 1936. The cumulative total for the year was 720,402 tons as against 1,232,034 tons in 1936.

The third report of the rice crop of Siam for the season 1937-38, issued by the Department of Agriculture and Fisheries, Bangkok, dated 21st December 1937 gives the cultivated area as 7,736,302 acres. The total damaged area is about 751,759 acres. Approximately 654,285 acres have been harvested, yielding 327,285 tons of padi.

Japan.—The latest information available was published in the October Summary.

French Indo-China.—Entries of padi into Cholon from 1st January to 15th November aggregated 1,315,186 tons as compared with 1,411,407 tons in 1936, a decrease of 6.8 per cent. Exports of rice during the same period totalled 1,387,806 tons as against 1,588,742 tons in 1936, a decrease of 12.6 per cent.

According to the Saigon rice report for November the November exports of rice to Hongkong, 4,791 tons, were far below the normal figure; exports of 16,108 tons to Shanghai were well above the average.

* Abridged from the Rice Summary for November 1937 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1936.

The Netherlands Indies.—The latest information was published in the October Summary.

Ceylon.—Imports of rice from January to November totalled 480,206 tons as compared with 479,151 tons in 1936, an increase of 0.2 per cent. Of these imports 17.1 per cent. were from British India, 70.2 per cent. from Burma, 0.1 per cent. from the Straits Settlements, and 12.6 per cent. from other countries. The corresponding 1936 percentages were 13.7, 62.5, 0.4 and 23.4.

Europe and America.—Shipments from the East to Europe during the period 1st January to 4th November totalled 1,013,904 tons, a decrease of 7.2 per cent. when compared with the 1936 figure of 1,092,859 tons. Of this year's shipments 41.7 per cent. were from Burma, 52.3 per cent. from Saigon, 4.3 per cent. from Siam, and 1.7 per cent. from Bengal. The 1936 corresponding percentages were 27.1, 63.0, 9.1 and 0.8.

Shipments to the Levant from 1st January to 21st October totalled 15,088 tons as compared with 12,551 tons in 1936, an increase of 20.2 per cent. During the same period, shipments to Cuba, West Indies and America were 213,141 tons as against 224,446 tons, a decrease of 5 per cent.

FERTILIZER PRICES, DECEMBER, 1937.

The following are the prices at the end of December, 1937, of some of the more important fertilizers. All quotations are ex Port Swettenham, F.M.S., or Singapore.

Product.		Analysis				Price per ton \$
		Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
			Soluble	Insoluble		
Sulphate of Ammonia	...	20	—	—	—	72.75
Calcium Cyanamide	...	20.6	—	—	—	80.00
Muriate of Potash	...	—	—	—	50	112.00
Sulphate of Potash	...	—	—	—	48	112.00
Superphosphate (concentrated)	...	—	39 - 40	—	—	105.00
Superphosphate	...	—	16 - 18	—	—	60.00
Basic Slag	...	—	16	—	—	50.00
Rock Phosphate (Christmas Island)	...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa)	...	—	11*	26 - 28‡	—	40.00
Lime	...	—	—	—	—	20.00

* Citric soluble.

‡ Total.

MALAYAN AGRICULTURAL EXPORTS, NOVEMBER, 1937.

PRODUCT.	Net Exports in Tons				
	Year 1936	Jan.-Nov. 1936	Jan.-Nov. 1937	November, 1936	November, 1937
Arecanuts ...	26,548	24,946	27,005	1,165	2,254
Coconuts fresh † ...	114,314†	107,493†	86,654†	8,724†	7,332†
Coconut oil ...	46,507	43,155	36,104	3,864	3,154
Copra ...	76,681	69,582	65,946	6,838	9,150
Gambier, all kinds ...	2,188	2,012	1,889	253	244
Copra cake § ...	20,438§	18,121§	14,167§	1,248§	1,662§
Palm kernels ...	4,964	4,674	6,817	541	1,399
Palm oil ...	29,296	26,648	39,552	2,874	4,013
Pineapples canned ...	76,403	70,900	75,401	3,097	3,862
Rubber ¶ ...	365,005¶	332,061¶	452,915¶	30,103¶	43,748¶
Sago,—flour ...	6,180	6,586	13,475	347	359
„ —pearl ...	3,319	3,047	3,507	253	388
„ —raw ...	7,484*	6,868*	7,583*	809*	780*
Tapioca,—flake ...	1,535	1,416	1,007	113	83
„ —flour ...	2,418*	1,956*	2,103*	353*	254*
„ —pearl ...	17,797	16,032	15,491	1,330	1,470
Tuba root ...	599	566	549	50	34

† hundreds in number.

* net imports.

¶ production.

§ gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1937	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January ...	1,984.8	865.0	360.4	156.0
February ...	1,759.6	1,851.8	323.6	308.7
March ...	1,798.4	1,473.4	358.7	256.1
April ...	1,573.1	1,237.2	308.0	226.0
May ...	1,587.6	1,285.2	257.8	186.4
June ...	1,671.8	1,611.7	288.9	252.5
July ...	2,651.0	1,860.5	411.6	269.6
August ...	3,767.7	1,762.2	616.8	274.0
September ...	3,179.5	1,492.5	621.6	247.1
October ...	3,037.6	1,393.9	569.1	216.1
November ...	2,419.8	1,448.8	455.9	176.7
Total ...	25,430.9	16,282.2	4,572.4	2,569.2
Total January—November, 1936	21,254.5	7,848.5	3,450.9	1,137.8
Total for the year 1936 ...	23,081.2	8,812.3	3,791.0	1,340.7

Stocks on estates at 30th November, 1937 were: palm oil 4,669 tons; palm kernels 443 tons.

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER,
FOR THE MONTH ENDING 30TH NOVEMBER, 1937.

STATE OR TERRITORY	ACREAGES OF TAPPABLE RUBBER NOT TAPPED										
	Estimated Acreages of Tappable Rubber (2)	Actual area tapped during the month Acreage (3)	Percent- age of (3) to (2) (4)	ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING (a)		AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED		Total area not tapped (5) + (7) (11)	Percent- age of (11) to (2) (12)
				Acreage (5)	Percent- age of (5) to (2) (6)	Acreage (7)	Percent- age of (7) to (2) (8)	Acreage (9)	Percent- age of (9) to (2) (10)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
STRAITS SETTLEMENTS :—											
Province Wellesley	43,743	28,434	65.0	—	—	15,309	35.0	418	1.0	15,309	35.0
Malacca	123,128	85,979	69.8	355	0.3	36,794	29.9	2,373	1.9	37,149	30.2
Penang Island	2,592	1,768	68.2	—	—	824	31.8	75	2.9	824	31.8
Singapore Island	32,760	21,238	64.8	1,171	3.6	10,351	31.6	125	0.4	11,522	35.2
Total S.S.	202,223	137,419	68.0	1,526	0.7	63,278	31.3	2,991	1.5	64,804	32.0
FEDERATED MALAY STATES :—											
Perak	290,735	221,438	76.2	1,210	0.4	68,087	23.4	6,585	2.3	69,297	23.8
Selangor	331,617	260,374	78.5	1,148	0.4	70,095	21.1	7,356	2.2	71,243	21.5
Negri Sembilan	258,341	191,418	74.1	1,775	0.7	65,148	25.2	8,173	3.2	66,923	25.9
Pahang	85,019	64,778	76.2	3,777	4.4	16,464	19.4	9,139	10.7	20,241	23.8
Total F.M.S.	965,712	738,008	76.4	7,910	0.8	219,794	22.8	31,253	3.2	227,704	23.6
UNFEDERATED MALAY STATES :—											
Johore	473,948	361,923	76.4	3,118	0.6	108,907	23.0	33,142	7.0	112,025	23.6
Kedah	177,543	135,804	76.5	2,854	1.6	38,885	21.9	5,331	3.0	41,739	23.5
Kelantan	28,326	22,712	80.2	273	1.0	5,341	18.8	3,266	11.5	5,614	19.8
Trengganu (b)	4,817	3,172	65.9	—	—	1,645	34.1	100	2.1	1,645	34.1
Perlis	1,330	689	51.8	—	—	641	48.2	107	8.0	641	48.2
Brunei	5,569	3,774	67.8	1,125	20.2	670	12.0	754	13.5	1,795	32.2
Total U.M.S.	691,533	528,074	76.4	7,370	1.0	156,089	22.6	42,700	6.2	163,459	23.6
Total Malaya	1,859,468	1,403,501	75.5	16,806	0.9	439,161	23.6	76,944	4.1	455,967	24.5

Notes:—(a) Area out of tapping on estates which have partly ceased tapping refers to areas definitely being rested and includes areas rested under rotational systems, but excludes areas on any tapping round in respect of Perlis only.
(b) Registered companies only.

MALAYAN RUBBER STATISTICS
TABLE I
STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX,
FOR THE MONTH OF NOVEMBER, 1937, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports			Exports including re-exports				Stocks at end of month			Consumption 3			
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Nov. 1937	during the month	Jan. to Nov. 1937	during the month		Jan. to Nov. 1937		during the month		Ports	Dealers	Estates of 100 acres and over					
								Foreign	Malay States & Labuan	Foreign	Malay States & Labuan	Foreign	Local				Foreign		Local		
MALAY STATES:— Federated Malay States	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
	...	8,908	14,823	14,452	150,562	7,921	82,145	Nil	Nil	Nil	Nil	16,224	5,012	167,098	58,833	...	9,879	14,976	13	171	
	...	2,594	5,077	6,404	65,096	4,189	45,633	Nil	69	Nil	2,378	3,862	6,567	37,988	74,081	...	2,673	5,231	...	...	
	...	611	3,696	3,800	37,097	1,202	13,998	Nil	Nil	Nil	Nil	2,308	2,597	23,488	27,121	...	516	3,888	...	...	
	...	17	16	19	169	27	272	Nil	Nil	Nil	Nil	Nil	48	Nil	432	...	16	15	...	...	
	...	592	345	377	4,094	834	8,889	Nil	Nil	Nil	Nil	Nil	308	947	3,516	9,058	561	332	...	...	
	...	55	50	347	3,302	174	1,652	Nil	Nil	Nil	Nil	Nil	521	Nil	4,954	...	55	50	...	...	
	...	23	59	68	681	95	932	...	...	...	...	...	144	...	1,558	...	31	70	...	...	
	...	12,800	24,066	25,467	261,001	14,442	153,521	Nil	69	Nil	2,378	22,702	15,836	...	232,090	176,037	...	13,731	24,562	13	171
	S. SETTLEMENTS:— Malacca	...	2,307	1,292	1,560	15,695	927	8,589	Nil	...	Nil	...	3,322	...	34,463	...	...	2,171	1,972	...	...
Province Wellesley	...	2,306	839	594	6,108	321	3,145	Nil	...	Nil	...	9,250	...	93,664	...	...	2,976	828	...	...	
Penang	2,096	5,880	23	25	219	141	*1,336	2,661	17,250	31,911	173,072	...	Nil	...	Nil	1,868	5,137	23	...	...	
Singapore	5,735	28,254	235	210	2,060	36	*1,032	9,646	...	166,969	...	22,576	...	264,630	...	...	5,791	26,007	244	33	
Labuan	...	32	Nil	Nil	Nil	25	209	89	...	617	...	Nil	...	Nil	...	...	47	Nil	...	355	
Total Straits Settlements	7,831	38,779	2,389	2,389	24,082	1,450	14,311	12,396	17,250	199,497	173,072	35,148	Nil	302,757	Nil	...	7,659	36,338	2,367	355	
Total Malaya	7,831	51,579	26,455	27,856	285,083	15,892	167,832	12,396	17,319	199,497	175,450	57,850	15,836	624,847	176,037	...	7,659	50,069	26,929	46	

* Figures amended.

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province Wellesley	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	8,780	25,398	4,902	4,885	2,171	173
WET RUBBER	1,099	609	235	340	502	343
TOTAL	9,879	26,007	5,137	5,225	2,673	516

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to Nov. 1937
Singapore	38,461	420,393
Penang	14,639	143,539
Port Swettenham	4,431	58,372
Malacca	319	2,543
MALAYA	57,850	624,847

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to Nov. 1937
Malay States	38,494	405,638
Straits Settlements	3,733	37,935
MALAYA	42,227	443,573

- Notes:—**
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
 2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. i.e. Column [7] = Columns [13] + [14] + [15] + [16] + [17] + [18] + [19] + [20] - [2] - [3] - [4] - [5] - [9] - [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
 3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
 4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
 5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
 6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 23rd December, 1937.

METEOROLOGICAL SUMMARY, MALAYA, NOVEMBER, 1937.

50

LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT				EARTH TEMPERATURE		RAINFALL							BRIGHT SUNSHINE.					
	Means of		Mean of A and B	Absolute Extremes				Total.		Most in a day.	Number of days.				Total.	Daily Mean.	Per cent.		
	A.	B.		Highest	Lowest	Max.	Min.				Precipitation .01 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more					
	Max.	Min.	°F	°F	°F	°F	°F	°F	in.	mm.	Amt.				hrs.				
			°F	°F	°F	°F	°F	°F							hrs.				
Railway Hill, Kuala Lumpur, Selangor	89.2	72.5	80.9	93	70	85	74	83.7	84.6	in.	298.5	2.11	25	21	4	6	148.05	4.93	41
Bukit Jeram, Selangor	88.0	72.6	80.3	91	70	85	74	84.1	86.1		150.9	2.83	21	11			196.50	6.55	55
Sitiawan, Perak	87.8	74.0	80.9	92	72	84	76	83.9	84.4		389.6	3.01	23	21	3	3	179.55	5.99	50
Temerloh, Pahang	88.8	72.8	80.8	92	71	82	74	85.6	86.3		207.8	1.42	21	20	2	1	168.65	5.62	47
Kuala Lipis, Pahang	88.5	71.9	80.2	91	70	80	74	84.2	85.0		350.5	2.58	24	21	1	15	154.75	5.16	43
Kuala Pahang, Pahang	85.6	73.9	79.7	89	72	80	76	84.1	86.0		355.9	6.80	19	15			209.00	6.97	58
Kallang Aerodrome, S'pore	85.8	74.9	80.3	89	72	81	77	82.3	83.7		228.6	2.00	17	14	9		157.75	5.26	43
Bayan Lepas Aerodrome Penang	86.3	74.3	80.3	90	73	82	76	84.1	84.4		344.7	3.96	26	19	6		188.00	6.27	53
Bukit China, Malacca	85.2	73.4	79.3	88	71	82	75	82.7	84.1		235.7	2.18	23	20	3	2	187.80	6.26	52
Kluang, Johore	87.9	71.4	79.7	91	69	83	73	81.9	82.6		226.6	2.52	26	20	5	13	155.00	5.17	43
Bukit Lalang, Mersing, Johore	85.4	72.0	78.7	89	70	79	74	81.8	81.9		262.6	2.17	21	15	1	1	195.70	6.52	54
Alor Star, Kedah	87.9	73.6	80.7	91	71	83	75	84.3	85.5		307.9	4.31	21	19	2	4	185.95	6.20	52
Kota Bharu, Kelantan	85.9	73.4	79.7	90	71	78	75	83.5	84.7		300.0	4.02	19	18		1	175.40	5.85	49
Kuala Trengganu, Trengganu HILL STATIONS.	85.1	73.1	79.1	88	71	76	75	82.6	84.3		189.5	2.94	16	12	2		193.15	6.44	54
Fraser's Hill, Pahang 4268 ft.	72.7	62.3	67.5	76	59	64	64	71.7	72.3		416.1	1.76	28	27	4	20	115.50	3.85	32
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.8	57.7	64.7	75	54	67	62	70.5	70.4		310.7	1.60	27	25		1	101.60	3.39	28
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.9	59.3	65.6	76	55	68	61				307.9	1.55	27	24		1	104.55	3.49	29

Compiled from Returns supplied by the Meteorological Branch, Malaya.